ASTRONAUTICA ACTA

AN ARCHIVE JOURNAL OF THE INTERNATIONAL ACADEMY OF ASTRONAUTICS

EDITOR-IN-CHIEF

MARTIN SUMMERFIELD, Princeton University, Princeton, N.J.

LIST OF CONTENTS AND AUTHOR INDEX

VOLUME 14
1968–69

Vol. 14 68/69

ARCHIVES DE L'ACADÉMIE INTERNATIONALE D'ASTRONAUTIQUE

ARCHIV DER INTERNATIONALEN ASTRONAUTISCHEN AKADEMIE

АРХИВНЫЙ ЖУРНАЛ МЕЖДУНАРОДНОЙ АКАДЕМИИ ПО АСТРОНАВТИКЕ

PUBLISHED BY PERGAMON PRESS / NEW YORK . OXFORD

EDITOR-IN-CHIEF: MARTIN SUMMERFIELD, Princeton University, Princeton, N.J.

CONTRIBUTING EDITORS

THOMAS L. BRANIGAN, TRW Systems, California
SANDERSON BUCHANAN, City University, London
RUDOLF PEŠEK, Ceškoslovenská Akademie Věd, Praha

PUBLICATION CONSULTANT

J. HERSEY, American Inst. of Aeronautics and Astronautics New York, N.Y.

TECHNICAL EDITOR

WOLDEMAR F. VON JASKOWSKY, Princeton University, Princeton, N.J.

PRODUCTION CONTROLLER

B. M. LISTER, Pergamon Press, Oxford

EDITORIAL ADVISORY BOARD

J. ACKERET, Eidgenössische Technische Hochschule, Zürich
P. AUGER, 12 rue Emile Faquet, 75–Paris 14
A. S. BAXTER, Bristol Siddeley Engines, Ltd., Bristol
L. BROGLIO, Scuola d'Ingegneria Aeronautica, Università di Roma
R. CALVO RODÉS, Comisión Nacional de Investigación del Espacio, Madrid
E. CARAFOLI, Academy of Sciences, Bucurest
L. CROCCO, Princeton University, Princeton, N.J.
B. FRAEIJS DE VEUBEKE, Université de Liège
F. HECHT, Analytisches Institut der Universität Wien
H. ITOKAWA, Institute of Industrial Science, University of Tokyo
A. KANTROWITZ, Avco-Everett Research Laboratory, Everett, Mass.
J. M. J. KOOY, St. Ignatiustraat 99a, Breda
V. I. KRASSOVSKY, Akademiya Nauk SSSR, Moskva
F. J. MALINA, 17 rue Emile Dunois, 92 Boulogue s/Seine, France
L. G. NAPOLITANO, Istituto di Aerodinamica, Università di Napoli
M. NICOLET, Centre Nat. de Recherches de l'Espace (CNRE), Bruxelles
A. PÉREZ-MARÍN, Inst. Nacional de Técnica Aeroespacia, (INTA), Madrid
R. PEŠEK, Ceškoslovenská Akademie Věd, Praha
M. ROY, International Council of Scientific Unions, COSPAR, Paris
L. I. SEDOV, Akademiya Nauk SSSR, Moskva
S. F. SINGER, U.S. Dept of the Interior, Washington, D.C.

Scope

ASTRONAUTICA ACTA is devoted to the international exchange of technical knowledge in astronautics. It is the editorial objective of the ACTA to place before the world community of research scientists and development engineers significant technological advances in astronautics that might not come to their attention so readily in their own countries. The ACTA covers current work in propulsion, astrodynamics, gas dynamics, guidance, space flight, and physics of the atmosphere and space, as well as other aspects of astronautics, and also offers authoritative reviews designed to widen awareness of research and development trends in these fields in countries throughout the world.

Submission of Manuscripts. (Consult the inside back cover for style requirements and mailing instructions.)

Reprints

Authors of original papers and review articles will receive 50 reprints of their papers free of charge and may order additional reprints at a nominal price.

INTERNATIONAL ACADEMY OF ASTRONAUTICS

Officers

PRESIDENT
C. STARK DRAPER, Massachusetts Institute of Technology, Cambridge, Mass.

PAST PRESIDENT
F. J. MALINA, Professional Offices, Paris

VICE PRESIDENTS
H. A. BJURSTEDT, Karolinska Institutet, Stockholm
E. A. BRUN, Université de Paris
A. MIKHAILOV, Pulkovo Astronomical Observatory, Leningrad
F. ZWICKY, California Institute of Technology, Pasadena, Calif.

SECRETARY
H. VAN GELDER, 250 rue Saint Jaques, Paris

EDITOR-IN-CHIEF, ASTRONAUTICA ACTA
M. SUMMERFIELD, Princeton University, Princeton, N.J.

LEGAL COUNSEL
V. KOPAL, Ceskoslovenská Akademie Věd, Praha

INTERNATIONAL ASTRONAUTICAL FEDERATION

Officers

PRESIDENT
E. CARAFOLI, Academy of Sciences, Bucaresti

PAST-PRESIDENT
L. G. NAPOLITANO, Instituto di Aerodinamica, Università di Napoli

VICE-PRESIDENTS
T. ANDJELIĆ, Beogradski Univerzitet, Beograd
R. BISPLINGHOFF, Massachusetts Institute of Technology, Cambridge, Mass.
L. I. SEDOV, Academiya, Nauk, SSSR, Moskva
T. M. TABANERA, Comisión Nacional de Investigaciones Espaciales, Beunos Aires

EXECUTIVE SECRETARY
H. VAN GELDER, 250 rue Saint Jacques, Paris

HONORARY SECRETARY
R. GREINACHER, Egghözlistrasse 76, CH-3006 Berne

GENERAL COUNSEL
V. KOPAL, Ceskoslovenská Akademie Věd, Praha

With publication of a manuscript the exclusive copyright for every language and country passes over to the Publishers. Photographic reproduction microfilm, etc., of single issues, papers or parts thereof, are not permitted unless special consent has been obtained from the publishers.
Published bi-monthly. **Subscription Rates:** For Libraries, Research Establishments and all other multiple-reader institutions (to be ordered through any bookseller, or directly from the Publisher) $35.00 (£12 10s); For members of societies which are also members of the I.A.F. (to be ordered directly from the Publisher) $5.00 (£1 10s); For members of the Academy (to be ordered directly from the Publisher) $5.00 (£1 10s); For any other category of individual subscriber, who will certify that the journal is for their personal use only (to be ordered directly from the Publisher) $10.00 (£3 10s).
Individual subscribers located in countries whose currencies are not readily convertible are entitled to pay in local currency, computed at the prevalent rate of exchange based on dollar subscription prices. Back issues are available, write for Back Issues Price List.
Copyright © 1968/69, Pergamon Press Ltd., Headington Hill Hall, Oxford England.
Pergamon Press Inc., Maxwell House, Fairview Park, Gimsford, New York, 10523, U.S.A.

Vol. 14 1968/6

LIST OF CONTENTS

No. 1 NOVEMBER 1968

Motion of a Vehicle in the Transition Region of the Three-Body Problem.....K. Forster, P. R. Escobal and H. A. Lieske 1

Experimental Studies Relating to the Combustion Mechanism of Composite Propellants.....J. D. Hightower and E. W. Price 11

Release Windows for the Ejection of a Body Along a Highly Eccentric Orbit.....H. Göllnitz and M. L. Renard 23

Transferts Impulsionnels, Economiques, entre Orbites Quasi-Circulaires, Proches, Non Coplanaires.....Jean-Pierre Marec 47

A Simplified Theory for Chemical Rockets.....Andrew G. Hammitt 57

Comments on "High Specific Impulse Thrust by Sputter-Ejection of Neutral Atoms" by Ben B. Meckel.....G. K. Wehner 65

Closing Comments by the Author.....Ben B. Meckel 69

Ex Mundo Astronautico

IAA Membership List, 1968..... 71

Programme of the International Academy of Astronautics 1968–1969..... 81

Summary Report of the XVIIIth International Astronautical Congress..... 83

Third International Symposium: Basic Environmental Problems of Man in Space..... 95

ol.
14
8/69

No. 2 FEBRUARY 1969

Simplified Model for Effect of Solid Heterogeneity on Oscillatory Combustion.....F. A. Williams and G. Lengelle 97

The Maximization of the Range of a High Lift, Low Thrust Missile in Horizontal Flight.....Robert J. Stern 119

Aerodynamic Torque on a Spinning Spherical Satellite with Application to Measurement of Accommodation Coefficients.....Gerald R. Karr and Shee-Mang Yen 131

An Estimate of the Prompt Photon Spectrum Arising from Cosmic-Ray Bombardment of the Moon.....T. W. Armstrong and R. G. Alsmiller, Jr. 143

Possible Tests of General Relativity Conducted with a Jupiter Probe.....George H. Brigman 151

A Discrete-Variable Approximation to Optimal Flight Paths.....Bion L. Pierson 157

An Elementary Calculation of the Combustion of Solid Propellants.....F. E. C. Culick 171

Ex Mundo Astronautico

International Academy of Astronautics Report for the Year 1967–1968..... 183

Second International Colloquium on Gasdynamics of Explosions and Reactive Systems: Call for Papers..... 191

No. 3 MARCH 1969

Fluid Dynamics of Heterogeneous Multi-Phase Continuous Media: International Symposium, Naples, October 1966.....**Symposium Editor: Luigi G. Napolitano**

Demixing Phenomena in Shear Flows of Non Sedimenting Suspensions.....F. Schultz-Grunow 193

Divers Régimes de Mélange de Deux Flux d'Enthalpies d'Arrêt Différentes .....
.....Emile Le Grivès et Jean Fabri 203

A Review of Problems in the Nonreacting Turbulent Far Wake.....
.....Herbert Fox, Victor Zakkay and Ram Sinha 215

An Investigation of the Turbulent Jets of Different Gases in a General Stream.....
G. N. Abramovich, O. V. Yakovlevsky, I. P. Smirnova, A. N. Secundov and S. Yu. Krasheninnikov 229
(Additional papers to appear in later issues)

Движение Искчсственного Спутника Относительно Нентра Масс и Резонанансы

(The Motion of an Artificial Satellite in Relation to the Centre of Gravity and to Resonance)
..... А. П. Торжевский (A. P. Torzhevskii) 241

Burning Rates of Polymethylmetacrylate in Mixtures with Ammonium Perchlorate or in Hybrid Systems when Mixed with Ammonium Chloride.....C. Vinckier and A. Van Tiggelen 261

Multiple Midcourse Maneuvers in Interplanetary Guidance.....Abolghassem Ghaffari 267

Ex Mundo Astronautico

I.A.F. Membership List 1968–1969..... 275

Constitution of the International Astronautical Federation..... 279

Statutes of the International Academy of Astronautics of the International Astronautical Federation 283

No. 4 APRIL 1969

Trajectories of Satellites Under the Combined Influences of Low Radial Thrust and Earth Oblateness.....Chong-Hung Zee 289

Усповйя Устойчивости Сисемы Гравиационной Стабилизации Спчтников с Гйродемпфированием

(Stability Conditions of the System of Gravitational Stabilization of Satellites Fitted with Gyrodamping).....**B. A. Сарычев** (V. A. Sarychev) 299

Castles in Space.....Walter M. Hollister 311

A Comparison of Various Elasticity Formulations Valid for all Admissible Values of Poisson's Ratio.....Gordon C. K. Yeh 317

Fine Structure of Hybrid Combustion.....Shun-i-chi Tsugé and Yoshito Fujiwara 327

Ex Mundo Astronautico

Report on the Fourth Lunar International Laboratory (LIL) Symposium: Applied Science Research and Utilization of Lunar Resources..... 337

XXth Congress of the International Astronautical Federation: Call for Papers..... 341

Conference on International Orbiting Laboratory and Space Sciences: Announcement and Call for Papers..... 347

XIXth Congress of the International Astronautical Federation: Programme..... 349

Vol
14
1968/

No. 5 JUNE 1969

Proceedings of the First International Colloquium on Gasdynamics of Explosions, Brussels, September 19–21, 1967.....**Symposium Editor: A. K. Oppenheim**

Preface.....A. K. Oppenheim 385

Papers Presented at the First International Colloquium on Gasdynamics of Explosions..... 389

Characteristics of the Voitenko High-Explosive-Driven Gas Compressor.....
..... David R. Sawle 393

Acceleration of Plasma in an Electromagnetic Field.....
.....J. Valensi, P. Parraud, B. Forestier and J. Bouesc 399

Nonlinear Oscillations in Liquid Rocket Combustion Chambers.....
.....Charles E. Mitchell, Luigi Crocco and William A. Sirignano 409

The Problem of Point Explosion in a Detonating Gas.....V. P. Korobeinikov 411

Collapsing Shock Waves in a Detonating Gas.....John H. Lee 421

Dynamic Behaviour of a Gas Under the Impact of Radiation.....John G. Hill 427

Gas Dynamic Motion with Radiation: A General Numerical Method.....Harold L. Brode 433

Interaction between Combustion and Gas Motion in the Case of Flames Propagating in Tubes
.....J. C. Leyer 445

On the Stability of Gasdynamic Discontinuities Associated with Chemical Reactions. The Case of a Spherical Flame.....A. G. Istratov and V. B. Librovich 435

Analysis of the Boundary Layer Preceding an Accelerating Flame.....
.....Ronald L. Panton and S. A. Berger 469

An Appraisal of the Continuous Explosion Laser.....J. R. Bowen and K. A. Overholser 475

Non-Equilibrium Effects in Recombination–Dissociation Reactions of Halogens from Shock Wave and Flash Photolysis Data.....J. A. Blake, R. K. Boyd, J. K. K. Ip and George Burns 487

The Interaction of a Shock Wave with a Body in the Presence of Ionization Relaxation.....
.....Yu. A. Dunaiev, M. P. Syschikova, M. K. Bereskina and A. N. Semenov 491

Experimental Studies of the Parameters of the Flow Behind a Shock Wave Moving in Relaxing Gas
.....I. M. Naboko, T. V. Bazhenova and R. G. Nemkov 497

Mach Reflection of Shock Waves in Real Gases.....
.....L. G. Gvozdeva, T. V. Bazhenova, O. A. Predvoditeleva and V. P. Fokeev 503

Observations on the Initiation of Detonation.....D. Pawel, H. Vasatko and H. Gg. Wagner 509

Transfer of Energy from an Exploding Wire to a Detonating Gas.....J. Brossard and M. Niollet 513

Computer Studies of Reaction Profiles in Gas Detonations.....
.....J. E. Dove, B. J. Scroggie and T. D. Tribbeck 521

The Structure of Transverse Waves in Detonations .....
..... D. H. Edwards and D. J. Parry 533

The Nature of Transverse Waves in Detonations.....Roger A. Strehlow 539

On the Structure of Single Headed Spin Detonations.....A. K. Macpherson 549

The Cellular Structure of Shock Waves and Detonation Waves .....
.....L. F. Henderson 559

Current Views on Gaseous Detonation.....John H. Lee, R. I. Soloukhin and A. K. Oppenheim 565

Vol. 14 68/69

No. 6 OCTOBER 1969

Fluid Dynamics of Heterogeneous Multi-Phase Continuous Media: International Symposium, Naples, October 1966. ..... Symposium Editor: Luigi G. Napolitano

Some Gasdynamic Problems in the Flow of Condensing Vapors .....Frank E. Marble 585

Morphology of Justice in the Space Age and the Boundaries of Outer Space.....F. Zwicky 615

Structure of a Diffusion Flame in the Presence of a Wall with One-Step Reversible Chemical Kinetics.....H. S. Mukunda and V. K. Jain 627

Some Results of the Global Investigation of the Lunar Surface.....Yu. N. Lipsky 639

Large Rate of Injection Normal to Surface in High Speed Flow.....A. Ismail and L. Ting 653

Turbulent Mixing of Gas–Particle and Pure Gas Streams.....
.....Duvvuri Tirumalesa and Rao S. Channapragada 665

Ex Mundo Astronautico

IAA Membership List, 1969..... 681

Vol
14
1968/

AUTHOR INDEX

(EMA—Ex Mundo Astronautico)

Abramovich G. N. 229
Alsmiller R. G. Jr. 143
Armstrong T. W. 143

Bazhenova T. V. 497, 503
Bereskina M. K. 491
Berger S. A. 469
Blake J. A. 487
Bouesc J. 399
Bowen J. R. 475
Boyd R. K. 487
Brigman G. H. 151
Brode H. L. 433
Brossard J. 513
Burns G. 487

Channapragada R. S. 665
Crocco L. 409
Culick F. E. C. 171

Dove J. E. 521
Draper C. S. 183 (EMA)
Dunaiev Yu.A. 491

Edwards D. H. 533
Escobal P. R. 1

Fabri J. 203
Fokeev V. P. 503
Forestier B. 399
Forster K. 1
Fox H. 215
Fujiwara Y. 327

Ghaffari A. 267
Göllnitz H. 23
Gvozdeva L. G. 503

Hammitt A. G. 57
Henderson L. F. 559
Hightower J. D. 11
Hill J. G. 427
Hollister W. M. 311

Ip J.K.K. 487
Ismail A. 653
Istratov A. G. 453

Jain V. K. 627

Karr G. R. 131
Korobeinikov V. P. 411
Krasheninnikov S. Yu. 229

Lee J. H. 421, 565
Le Grivès E. 203
Lengelle G. 97
Leyer J. C. 445
Librovich V. B. 453
Lieske H. A. 1
Lipsky Y. N. 639

Macpherson A. K. 549
Malina F. J. 337 (EMA)
Marec J. P. 47
Meckel B. B. 69
Mitchell C. E. 409
Mukunda H. S. 627

Naboko I. M. 497
Nemkov R. G. 497
Niollet M. 513

Oppenheim A. K. 385, 565
Overholser K. A. 475

Panton R. L. 469
Parraud P. 399
Parry D. J. 533
Pawel D. 509
Pierson B. L. 157
Predvoditeleva O. A. 503
Price E. W. 11

Renard M. L. 23

Sarychev V. A. 299
Sawle D. R. 393
Schultz-Grunow F. 193
Scroggie B. J. 521
Secundov A. N. 229
Semenov A. N. 491
Sinha R. 215
Sirignano W. A. 409
Smirnova I. P. 229
Souloukhin R. I. 565
Stern R. J. 119
Strehlow R. A. 539
Syschikova M. P. 491

Ting L. 653
Tirumalesa D. 665
Torzhevskii A. P. 241
Tribbeck T. D. 521
Tsugé S. 327

Valensi J. 399
Van Tiggelen A. 261
Vasatko H. 509
Vinckier C. 261

Wagner H. Gg. 509
Wehner G. K. 65
Williams F. A. 97

Yakovlevsky O. V. 229
Yeh G. C. K. 317
Yen Shee-Mang 131

Zakkay V. 215
Zee C. H. 289
Zwicky F. 615

Vol. 14 68/69